

REMARKS/ARGUMENTS

Applicants' attorney thanks Examiner Nguyen for his Office Action dated April 14, 2006. Claims 10, 12, 25 and 26 have been amended to address certain issues. Claims 1-9 and 19-21 were previously cancelled. Claims 23 and 24 are cancelled herein. Claims 33-42 are added. Therefore, Claims 10-18, 22, and 25-42 are now pending in the application.

Objections to the Specification

The Examiner has objected to the form and length of the Abstract. Accordingly, the Abstract has been made more concise and shortened. All of the concerns expressed by the Examiner are believed to have been addressed by the changes made by Applicants. No new matter has been added. Accordingly, the Applicants respectfully request that the pending objections to the Abstract be withdrawn.

Objections to the Drawings

The Examiner has objected to the drawings as they relate to Claims 23 and 24. Claims 23 and 24 are cancelled in this amendment. Accordingly, this amendment is believed to obviate the objections to the drawings. Accordingly, the Applicants respectfully request that the pending objections to the drawings be withdrawn.

Rejections Under 35 U.S.C. § 112

Claims 25-32 have been rejected under 35 U.S.C. § 112, 2nd paragraph as being indefinite.

As to Claim 25, the Applicants have clarified this language by the following amendment "annealing the substrate, so that the barrier materials ... form a final barrier layer at the interface between the first portion of the seed layer and the insulating layer". It is believed that this change clarifies the language and correctly reflects the scope of the invention. The Applicants thank the Examiner for guidance in this matter. Therefore, the Applicants respectfully submit that the foregoing amendment addresses this ground of rejection. Therefore, the Applicants respectfully request that this ground of rejection be withdrawn.

As to Claim 26, the Applicants have clarified --barrier material-- to read "barrier materials" thus removing the offending language from the claim. Therefore, the Applicants respectfully submit that the foregoing amendment addresses this ground of rejection and, therefore, Applicants respectfully request that this ground of rejection be withdrawn.

As to dependent Claims 27-32, the Applicants respectfully submit that the previously discussed amendments to Claims 25 and 26 should address the objections to the claims raised under 35 U.S.C. § 112. Therefore, the Applicants respectfully submit that the foregoing amendments address all 112 grounds of rejection and, therefore, Applicants respectfully request that this ground of rejection be withdrawn as to all Claims 25-32.

The Applicants point out that no art based rejections of Claims 25-32 have been made. As a result, no art based amendments to these claims have been made.

Rejection Under 35 U.S.C. § 102

Claims 10-15 and 22-24 have been rejected under 35 U.S.C. § 102(b) as being anticipated by the background.

Claim 10 is amended to clarify the scope of the claim and more clearly point to certain patentable subject matter. Claim 10, as amended, now recites "forming at least ~~one barrier layer~~ two barrier layers on the insulating layer and in the opening, wherein the two barrier layers include a first barrier layer and a second barrier layer fabricated so each have a different material composition" and "forming a copper seed layer on the at least ~~one barrier layer~~ two barrier layers". This two layer (or more) composite barrier layer is not taught by the specification which only comprehends that a single barrier layer or a single material is used. Additionally, in the claimed invention teaches and claims two generally different materials (e.g., tantalum nitride 1st layer and vanadium 2nd layer for example) in the layers which work together to enhance barrier performance and copper adhesion. This simply is not taught or suggested by the background. Accordingly, as amended, Claim 10 overcomes the anticipation rejection made. Therefore, the Applicants respectfully request that this ground of rejection be withdrawn as to Claim 10 and the claims depending therefrom (Claims 11-15 and 22 (Claims 23 and 24 being cancelled)).

Also, Claims 10-15 and 22-24 have been rejected under 35 U.S.C. § 102(e) as being anticipated by *Marieb et al* (Appl. Serial No 2004/0224507, hereinafter "*Marieb*"). Claim 10, as

amended, teaches two barrier layers with a seed layer overlying them. The cited art teaches at best a "barrier layer 602" covered with "a doped seed layer 604" which is capped with another seed "layer 606" (See, *Marieb* [0040]). Accordingly, as amended, Claim 10 overcomes the anticipation rejection made. Therefore, the Applicants respectfully request that this ground of rejection be withdrawn as to Claim 10 and the claims depending therefrom (Claims 11-15 and 22 (Claims 23 and 24 being cancelled)).

Although each dependent claim has its own dependent basis for patentability, the Applicants believe that the sufficiency of the underlying arguments and amendments in support of independent Claim 10 obviate any need for further explanation of the dependent claims. However, as one example of the independent basis of patentability for the dependent claims, the Applicants point out that Claim 15 recites that "the second barrier layer consists of a material selected from the group: palladium, chromium, tantalum, magnesium, and molybdenum." This is not taught in the cited art.

Accordingly, the Applicants respectfully submit that the amendments to the claims overcome the rejection as to Claims 10-15 and 22.

Rejections Under 35 U.S.C. §103

Claims 16-18 are rejected under 35 U. S. C. § 103(a) as being obvious over *Marieb*.

The Applicants begin by pointing out that *Marieb* is (in view of the amendments made) no longer sufficient to reject base Claim 10. Nothing is offered in the Action to correct that fundamental insufficiency. Accordingly, all of these claims (e.g., Claims 16-18) are believed to overcome the rejections based on *Marieb*.

However, the Applicants further point out that the *Marieb* doped seed layer is formed by co-deposition and magnetron sputtering (*Marieb* at paragraphs [0039]-[0040]) and due to the danger of oxidation is treated with a subsequent capping layer (*Marieb* at paragraphs [0039]-[0040]). The Action then offers that implantation is suggested by the cited art. One point of ion implantation (as in Claim 16) is to drive the dopants beneath the surface of the barrier layer. Thus, oxidation effects can be seriously reduced. Thus, the invention does not require the capping layers taught by the cited art. In fact such a capping layer can be construed as teaching against a need for such implantation.

Thus, for these many reasons, the Applicants respectfully submit that the cited art is overcome by the amendments and arguments made herein and that these claims (16-18) should also be allowed.

Double Patenting Rejections

Claims 10-15 and 22-24 have been rejected under the judicially created doctrine of obviousness type double patenting.

The Applicants begin by pointing out that the claimed invention requires multiple layers of barrier and includes a wide range of materials not addressed in the claims of the 6,727,177 patent (hereinafter the '177 patent). Thus, the Applicants respectfully submit that the '177 patent is insufficient to reject base Claim 10 and its dependent claims. Nothing is offered in the Action to correct the fundamental limitations of the '177 claims. Accordingly, all of these rejected claims (e.g., Claims 16-18) are believed to overcome the rejections based on the '177 patent.

However, the Applicants are open to the idea of filing an appropriate terminal disclaimer at some future time should it become necessary in the future.

Thus, for these many reasons, the Applicants respectfully submit that the cited art is overcome by the amendments and arguments made herein and that these claims (10-18 and 22) should be allowed to issue.

Claims 25-32

These claims have been superficially amended to correct certain objections raised as to form in the Action. These have been fully addressed. No art has been offered to reject these claims. Accordingly, the Applicants respectfully submit that these claims are now in allowable form.

Added Claims:

Claims 33-42 has been added to capture certain patentable subject matter. In particular, the claims are directed to an approach using two seed layers separated by a barrier layer where the topmost seed layer is subsequently treated to form a bulk copper containing layer. The Applicants respectfully submit that these claims are allowable as submitted.

Conclusion:

In view of the foregoing amendments and remarks, it is respectfully submitted that the claimed invention as presently presented is patentable over the art of record and that this case is now in condition for allowance.

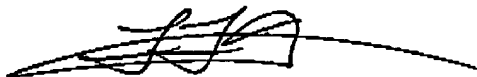
Accordingly, the Applicants request withdrawal of all pending rejections and request reconsideration of the pending application and prompt passage to issuance. As an aside, the Applicants clarify that any lack of response to any of the issues raised by the Examiner is not an admission by the Applicants as to the accuracy of the Examiner's assertions with respect to such issues. Accordingly, Applicants specifically reserve the right to respond to such issues at a later time during the prosecution of the present application, should such a need arise.

As always, the Examiner is cordially invited to telephone the Applicants' representative to discuss any matters pertaining to this case. Should the Examiner wish to contact the undersigned for any reason, the telephone number set out below can be used.

If any fees are due in connection with the filing of this Amendment B, the Commissioner is hereby authorized to charge such fees to Deposit Account 12-2252 (Order No. 01-471/1D).

Respectfully submitted,

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